Executive Summary
The Potential for Area-Based Harvest Regulation in BC

Why Regulate Timber Harvests?

Regulation of timber harvest has been a principle of forest management since the development of the discipline in eastern Europe in the 18th century. In fact, the first harvest regulation was area-based, with the harvest level calculated by dividing the land base by the desired rotation or harvest age of the timber crop.

The concepts of harvest regulation and allowable annual cuts (AACs) were initiated in BC through the Sloan Commission of 1945. Sloan saw harvest regulation as an instrument to establish a sustained yield policy in which allowable annual cuts were to prevent the depletion of the timber resource over time and provide some continuity of harvest for community stability.

In BC today, an allowable annual cut for a defined management unit is set by the provincial Chief Forester considering the current land use decisions and forest practices. Administration of the *Forest Act* has required AACs to be defined on a volume basis - as the amount of timber volume that can be harvested from a management unit each year.

The Area-based Concept

At its simplest, area-based harvest regulation would define allowable annual cuts as the number of hectares that could be harvested annually. Area-based harvest regulation does not imply or require any changes in current land use or forest practices.

The basic objective of this concept is to simplify the determination of AACs, while improving public understanding of these determinations. Also, this approach will relieve the forest industry of some regulatory and administrative burden while still ensuring the stewardship of British Columbia's forests.

Advantages

The advantages that have been identified for this alternative approach include:

Improved public understanding: Perhaps the most significant advantage of area- based harvest regulation is the expected increase in public credibility in the timber supply review process and allowable annual cut determinations. Area-based harvest limits are much easier to explain and to understand. They are more intuitively appealing. Harvest levels specified and controlled by area rather than volume units provide a more easily planned and measured verification of sustained-yield objectives, which the public is seeking.

Clear land use tradeoffs: Where land use choices are being considered in a land use planning process, with an area-based AAC, a reduction in the timber harvesting land base for non-timber uses would create a reduction in the projected timber supply, in the short and long term. This would early illustrate the land use choices. As many non-timber uses can be defined in area terms, multi-stakeholder tradeoffs should be easier to identify when everything is expressed in the same area terms.

Simplified timber supply analyses: In the current AAC determination process, substantial resources are devoted to the translation of forest areas into timber volume terms. This information is often disputed by many stakeholders and is not well understood by the public. With area-based regulation, this information would be much less important, thus significantly reducing the time and friction in the process.

Less government regulation: In terms of government regulation, timber tenure administration on an area basis is likely to reduce government costs, decrease government interference in industry decisions, and give the private sector more control over its business.

Important Cautions

Area-based allowable annual cuts are not the same as (so-called) ***area-based tenures***. The term 'area-based tenure', is used in BC to refer to a tenure with a single licensee being responsible for managing a specified unit of land, much like a woodlot or tree farm licence.

Area-based harvest regulation is also not the same as ***spatially explicit timber supply analysis***. Timber supply analyses evaluate the potential flow of timber over time from a specific management unit; spatially explicit analyses track individual areas within a management unit during an analysis. An area-based AAC defines the amount of area that can be harvested but it does not define which tracts of forest can be cut.

Challenges

The greatest challenge to implementing this concept will perhaps be overcoming the human tendency to resist a fundamental change of this nature. There are also technical challenges as follows:

Setting projected harvest ages: Area-based regulation requires definition of projected harvest ages – the age of forests when they will be harvested. This is also a challenge with volume-based regulation, and can likely be addressed using the current approaches.

Partial harvesting: Concerns have been expressed about how partial harvesting will be translated into an area basis, and how partial harvest objectives will be enforced. Potential solutions have been identified for these challenges – they now must be tested.

Equitable operating areas: With volume based regulation licensees within timber supply areas have been assigned operating or chart areas from which they harvest their assigned volume. If operating areas have to be reassigned to achieve consistent and equitable implementation of an area-based allowable annual cut, there may be difficulties that are not easy to resolve. Achieving equitable redistribution in timber supply areas will be a significant challenge to implementing area-based harvest regulation.

Timber tenure administration: The administration of timber tenures is closely tied to traditional volume-based harvest regulation in the province. Significant challenges exist to shift the administration process, but they are not unsurmountable. Some additional costs will be incurred to establish a new system.

Next Steps

Extensive and wide ranging discussion and consideration of the options for harvest regulation have occurred within government and with others. There is general agreement about the need for a 'toolkit' of harvest regulation tools that can be used in appropriate circumstances. Testing a range of options is broadly supported.

The first step has been to amend the *Forest Act* to permit area-based harvest regulation. This legislation has now been approved (*Forest Act Section 151.3)*. This opens the door for active trials as follows:

- **Partitioned cuts**: Where it is appropriate, in the ongoing Timber Supply Review the Chief Forester will define partitioned cuts on an area basis. The AAC decision for the Cranbrook TSA includes an area-based partitioned cut for dense pine problem forest types, and for restoration of fire-maintained ecosystems. (See www.for.gov.bc.ca/tsb/tsr2/tsa/tsa06/ration/c-berry.pdf).
- **Woodlots:** There is substantial interest in testing this concept with woodlot licenses. A provincial trial has been proposed to involve a number of woodlots around the province. See the Woodlot License Trial Project website at: www.for.gov.bc.ca/research/woodlot.
- **Tree farm licences:** Several tree farm licensees have expressed interest in testing area-based regulation, working cooperatively with the Forest Service.

Shifting to area-based harvest regulation with timber supply areas where volume-based licenses prevail creates challenges that will require innovative solutions. The Forest Service is willing to test the concept where licensees are collectively interested in cooperating in a trial. To improve understanding of the implications of shifting to an area-based regime, analysis of area as well as volume is being incorporated in the Timber Supply Review for timber supply areas, as time and resources permit.

The Ministry of Forests is committed to broadly communicate the results of trials and further technical work.

A report outlining the status of discussion on area-based AACs and new information will be posted on the Area-based Allowable Annual Cut Analysis Project website at: www.for.gov.bc.ca/research/areaaac.

The Potential of Area-Based Harvest Regulation in BC

Status of Discussions

BC Ministry of Forests
Timber Supply Branch

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Summary

Regulation of timber harvest has been a principle of forest management since the development of the discipline in eastern Europe in the 18th century. In fact, the first harvest regulation was area-based, with the harvest level calculated by dividing the land base by the desired rotation or harvest age of the timber crop.

The concepts of harvest regulation and allowable annual cuts (AACs) were initiated in BC through the Sloan Commission of 1945. Sloan saw harvest regulation as an instrument to establish a sustained yield policy in which AACs were to prevent the depletion of the timber resource over time and provide some continuity of harvest for community stability.

In BC today, an AAC for a defined management unit is set by the provincial Chief Forester considering the current land use decisions and forest practices. Administration of the *Forest Act* has required that AACs be defined on a volume basis - the amount of timber volume that can be harvested from an area each year.

At its simplest, area-based harvest regulation would define AACs as the number of hectares that could be harvested annually. Area-based harvest regulation does not imply or require any changes in current land use or forest practices. Area-based harvest regulation is not the same as an area-based tenure, which in BC refers to a single operator being responsible for managing a specified unit of land, similar to a woodlot or tree farm license in BC today.

The basic objective of this concept is to simplify the determination of AACs, while improving public understanding of these determinations. Also, this approach will relieve the forest industry of some regulatory and administrative burden while still ensuring the stewardship of British Columbia's forests.

The advantages of area-based harvest regulation include:

- *Improved public understanding*: Perhaps the most significant advantage of area-based harvest regulation is the expected increase in public credibility in the timber supply review process and AAC determinations. Area-based harvest limits are much easier to explain and to understand. They are more intuitively appealing. Harvest levels specified and controlled by area rather than volume units provide a more easily planned and measured verification of sustained yield objectives, which the public is seeking.
- *Clear land use tradeoffs*: Where land use choices are being considered in a land use planning process, with an area-based AAC, a reduction in the timber harvesting land base for non-timber uses would create a reduction in the projected timber supply, in the short and long term, clearly illustrating the choices. As many non-timber uses can be defined in area terms, multi-stakeholder tradeoffs should be easier to identify when everything is expressed in the same area terms.

- *Simplified timber supply analyses*: In the current AAC determination process, substantial resources are devoted to the translation of forest areas into timber volume terms. This information is often disputed by many stakeholders and is not well understood by the public. With area-based regulation, this information would be much less important, thus significantly reducing the time and friction in the process.
- *Less government regulation*: In terms of government regulation, timber tenure administration on an area basis is likely to reduce government costs, decrease government interference in industry decisions, and give the private sector more control over its business.

The greatest challenge to implementing this concept will perhaps be overcoming the human tendency to resist a fundamental change of this nature. There are also technical challenges as follows:

- *Setting projected harvest ages*: Area-based regulation requires definition of projected harvest ages – the age of forests when they will be harvested. This is also a challenge with volume-based regulation.
- *Partial harvesting*: Concerns have been expressed about how partial harvesting will be translated into an area basis, and how partial harvest objectives will be enforced. Potential solutions have been identified for these challenges – they now must be tested.
- *Equitable operating areas*: With volume-based regulation in timber supply areas, licensees have been assigned operating or chart areas from which they harvest their assigned volume. If operating areas have to be reassigned to achieve consistent and equitable implementation of an area-based AAC, there may be difficulties that are not easy to resolve. Achieving equitable redistribution in timber supply areas will be a significant challenge to implementing area-based harvest regulation.
- *Timber tenure administration*: The administration of timber tenures is closely tied to traditional volume-based harvest regulation in the province. Significant challenges exist to shift the administration process, but they are not unsurmountable. Some additional costs will be incurred to establish a new system.

Extensive and wide ranging discussion and consideration of the options for harvest regulation have occurred within government and with others. There is general agreement about the need for a 'toolkit' of harvest regulation tools that can be used in appropriate circumstances. Testing a range of options is broadly supported.

The first step has been to amend the *Forest Act* to permit area-based harvest regulation. This legislation has now been approved (*Forest Act Section 151.3)*. This opens the door for active trials as follows:

- *Partitioned cuts*: Where it is appropriate, in the ongoing Timber Supply Review the Chief Forester may define partitioned cuts on an area basis. The AAC determination for the Cranbrook TSA includes an area-based partitioned cut for dense pine problem

forest types, and for restoration of fire-maintained ecosystems. (See the Chief Forester's rationale for this determination at www.for.gov.bc.ca/tsb/tsr2/tsa/tsa06/ration/c-berry.pdf.)

- *Woodlots*: There is substantial interest in testing this concept with woodlot licenses. A provincial trial has been proposed to involve a number of woodlots around the province. (See the Woodlot License Trial Project website at: www.for.gov.bc.ca/research/woodlot)
- *Tree farm licenses*: Several tree farm licensees have expressed interest in being trial sites for area-based regulation, working cooperatively with the Forest Service.

Shifting to area-based harvest regulation in timber supply areas where volume-based licenses prevail creates challenges that will require innovative solutions. The Forest Service is willing to test the concept where licensees are collectively interested in cooperating in a trial. To improve understanding of the implications of shifting to an area-based regime, analysis of area as well as volume is being incorporated in the Timber Supply Review for timber supply areas, as time and resources permit.

The Ministry of Forests is committed to broadly communicating the results of trials and further technical work. New information will be posted on the Area-based Allowable Annual Cut Analysis Project website at: www.for.gov.bc.ca/research/areaaac.

A. Introduction

Control of the rate of consumption of natural resources is one of the most important and controversial aspects of natural resource management throughout the world. In British Columbia regulation of the timber harvest receives a great deal of attention not just within the province, but globally.

In BC, and in most jurisdictions around the world, the rate of timber harvest is established and controlled using units of timber *volume* over time (for example cubic metres per year). An alternative approach would use *area* over time to define and control the rate of harvest (for example hectares per year).

The implications of adopting this alternative approach in BC have been contemplated and examined for some time. This paper compiles the information and viewpoints that have developed regarding this approach, highlighting the advantages and challenges.

The purpose of this document is to provide an introduction to the topic of area-based timber harvest regulation in BC as a starting point for further exploration and debate on what could be a major policy shift in forest management in BC. This new policy is being contemplated during a time of substantial and rapid change in forest policy generally. Some of the conclusions drawn in this paper will need to be amended under different policy circumstances.

Important Cautions

Regulating the rate of harvest with area-based allowable annual cuts is not the same as (so-called) ***area-based tenures***. The term 'area-based tenure', as it is popularly used in BC today, might be better referred to as single-operator tenure, with a single licensee being responsible for managing a specified unit of land, much like a woodlot or tree farm licence in BC today.

Area-based harvest regulation is also not the same as ***spatially explicit timber supply analysis***. Timber supply analyses evaluate the potential flow of timber over time from a specific management unit; spatially explicit analyses track individual areas within a management unit during an analysis. An area-based AAC defines the amount of area that can be harvested but it does not define which tracts of forest can be cut.

B. Purpose of an Allowable Annual Cut

Regulation of timber harvest has been a principle of forest management since the development of the discipline in eastern Europe in the 18th Century. In fact, the first harvest regulation was area-based, with the harvest level calculated by dividing the land base by the desired rotation age of the timber crop. This classic method worked well where forest

units was reasonably small and homogenous and where the desired harvest rotation was known and agreed to.

In BC, the concept of harvest regulation and allowable annual cuts (AACs) were substantially initiated through the Sloan Commission of 1945. At that time, Sloan saw harvest regulation as an instrument to establish a sustained-yield policy. By his definition, sustained yield was to provide "timber in yearly or periodic quantities of equal or increasing volume". As such, allowable annual cuts were to prevent the depletion of the timber resource over time and provide some continuity of harvest for community stability. In harvest regulation jargon this is known as an 'even-flow' policy.

Today, many look to allowable annual cuts to also ensure sound forest practices and sustained ecosystems, and to foster implementation of particular land use strategies. In fact, some people suggest it is the AAC that drives land use and forest practices, when in practice the relationship is in the reverse.

In BC today, an AAC for a defined management unit is set considering the current land use decisions and forest practices – the AAC is the result of laws, regulations and policies relating to land use and forest practices which apply to each unit. While the AAC clearly defines the amount of volume that can be harvested from an area, it does not control where or how the timber is harvested – this is the domain of forest practices and land use plan implementation.

The primary purpose of AACs in BC today is consistent with the expectations set by Sloan in 1945 – to avoid depletion of the timber resource over time, and to provide some continuity of harvest.

C. The Concept

Since Sloan's time, allowable annual cuts in BC have been established based on volume (currently cubic metres per year). Harvest levels based on timber volume more directly relate to forest industry values and lend themselves to translation into stumpage revenue projections. However, basing harvest-level regulation and allowable annual cuts on timber volume is complex and requires significant resources to carry out the compilation of growth and yield data, timber supply analysis, allowable cut determination, and tenure administration. It also places the government in the position of managing what many see as the forest industry's business – volume processed by mills – when the public's interest is in the land, not just the timber volume.

While many aspects of timber supply analysis and AAC determination are subject to scrutiny and debate, information relating to timber volume inputs and outputs probably attract the most attention, and have been the most variable over time. Removing this source of uncertainty and workload from the timber supply analysis and AAC determination process is expected to create substantial savings.

In BC today, the preponderance of old forests with high timber volumes, current government direction regarding harvest regulation,

and defining allowable annual cuts in volume units creates declining timber supply forecasts for some management units. This leads the public to question whether Sloan's intention, and government policy, of 'sustained yield' is being met. An area-based AAC determination policy is expected to remove this artifact, improving public credibility in forest management in the province.

The potential to simplify harvest regulation and the technical aspects of AAC determinations while improving overall understanding has attracted the attention of individuals in government, industry and environmental groups. In addition, it may offer an alternate way of demonstrating the sustainability of BC's timber supply.

Regulating allowable cuts according to hectares harvested per year, would give the forest industry more responsibility and flexibility to manage the flow of volume and value harvested over time. This increased flexibility may lead to more fluctuations in volume and value flow and hence employment and government revenues, although, this may be no less stable than the current situation.

At its simplest, harvest regulation policy using an area-based philosophy would define allowable annual cuts as the number of hectares that could be harvested annually. Ideally an even flow policy would be adopted, with an equal number of hectares harvested each year. While this is not a necessity, managing under a different flow policy (such as the declining-flow policy used currently for B.C.'s volume regulation) may continue a perception that BC is not managing its forests "sustainably", and little would be gained. Of course, while the area harvest may be constant, the volume harvest may vary over time as not all sites yield the same volume per hectare.

The basic objective of this initiative is to introduce simplicity in the determination of permitted harvest levels and to relieve government and the forest industry of some regulatory and administrative burden while still ensuring the stewardship of British Columbia's forest land base.

> Area-based harvest regulation does not imply nor require any changes in exiting forest practices.

D. Potential Advantages and Drawbacks

The potential to simplify and improve understanding of harvest regulation prompted examination of the area-based option. This section summarizes the analytical studies, discussions and a Forest Service workshop that have attempted to answer the question: Does a harvest-level regulation system based on hectares harvested per year offer any improvements over the current volume-oriented system?

Topics are reviewed in the current sequential order of land management for forest products in the province, starting with land use, operational planning and forest practices; moving to the timber supply review and AAC determination; then into the complex realm of timber license administration; and finally, the international marketplace and certification.

1. Land use planning

Land use planning includes Regional Land Use Plans, Land and Resource Management Plans, Local Resource Use Plans, and establishing higher level plans. These are strategic level plans defining the types of resource management and use permitted within specified areas. Area-based harvest regulation is perceived to be advantageous in land use planning for the following reasons:

- Stakeholder understanding of timber interests, the differences between area and volume considerations, and AACs is expected to improve.
- Non-timber resources considered in land use planning tend to be stated in area terms so improved consistency in quantifying resources is expected.
- A reduction in the timber harvesting land base for non-timber uses would create a reduction in the projected timber supply, in the short and long term, clearly illustrating the choices and prompting thoughtful consideration.
- Multi-stakeholder tradeoffs should be easier to identify when everything is expressed in the same area terms.
- Many timber targets set in land use planning are currently defined in area terms. For example, in the Cariboo-Chilcotin Land Use Plan, access to land base area for timber production was key, not an AAC in volume terms; in North Island Timber Targets the emphasis is on the timber harvesting landbase, not volume. Consequently, area-based AACs may bring land base targets and AAC consequences closer together.
- It may help to overcome perceived timber bias in land use planning.

A drawback that has been identified is the potential for confusion between land use planning 'targets' which define the amount of area that is to be available for a specified use, and area-based AACs. Another potential drawback could be the expectation that AACs will be set for management zones that are defined in land use plans, creating many AACs and complicating AAC administration.

2. Operational planning

Operational planning for forest management in BC has, in recent years, included forest development plans—five year plans outlining where and how timber will be harvested, and how non-timber resources will be protected—and silviculture prescriptions and stand management plans which define management objectives and practices for specific cutblocks. Reducing the number of operational plans that are required under the Forest Practices Code is currently being considered.

No drawbacks have been identified with regard to operational plans, regardless of the number of plans that are required. Area-based harvest regulation is seen to be compatible with forest development plans because these plans are, for the most part,

area-based, illustrating the implementation of objectives in higher level strategic plans, which are often also area-based. The potential for high-grading – taking the best timber now, leaving an uneconomic forest for the future – is a concern. However, this is no more of a possibility than with volume-based harvest regulation, continuing the need for thorough review before approval of forest development plans. Neither silviculture prescriptions nor stand management plans are seen to be impacted by a shift in harvest regulation policy.

3. Forest management practices

Two forest management practices have been identified as possibly being impacted by a change to area-based harvest regulation:

- **On-site utilization**: Ministry of Water, Land and Air Protection have expressed concerns that utilization will be either inadequate or overachieved, leaving either too much or too little coarse woody debris on sites. Ongoing compliance and enforcement monitoring of forest practices regulations and policies should address this concern.
- **Silviculture investment:** The loss of a potential 'allowable cut effect' from intensive silviculture investments with area-based harvest regulation is a concern. With volume-based harvest regulation, investments in intensive silviculture are implemented to improve the volume of timber available from an area. Incentives presently exist to encourage private investment in intensive forest management on public lands. For example, tree farm licenses and woodlot licenses are single-operator, long-term agreements that entitle the holder to the benefits accruing from intensive management. Another example is the Innovative Forest Practice Agreement where licensees may seek an immediate increase in their volume AAC for improvements in information or for conducting intensive management treatments.

Some observations regarding the current incentives:

- They are oriented towards the concept that benefits occur in the form of increases to volume yield (rather than value yield) and that this should lead to an *immediate* increase in the volume AAC – the allowable cut effect (ACE).
- The estimation, nature, and magnitude of benefits from intensive silviculture are often the subject of debate and negotiation. Since the benefits are expected to be translated into immediate timber supply impacts, these debates are sometimes heated and fractious.
- Often where such incentives have been exercised, they have been as a result of government funding—hence there has been little risk to the licensee conducting the beneficial treatment.
- They have not been exercised widely.

The potential for investments in intensive silviculture to generate returns exists with area-based AACs as well, but the types of investments shift from those which only influence volume, to include those that influence value.

Under an area-based harvest regulation policy, it is envisioned that a fairer incentive system might be developed which is similarly area-based. Under such a system, a licensee conducts a treatment and captures the benefit by returning to the site to harvest the resulting timber. With area-based regulation, the benefit—whether volume or value—need not be quantified beforehand, nor is a change in area AAC necessary for the licencee to capture it.

There is a shift in who bears the risk however. In the current situation the public has borne much of the risk associated with silviculture investments because once the treatments are completed, the potential increased volume production is added to the current harvest level, without certainty that the treatment would generate these benefits. However, in the area-based context, the licensee bears the risks associated with the investment – if the benefits do not occur, the licensee does not realize the benefit.

4. Timber supply information

Under an area-based harvest regulation policy, there is an opportunity to simplify the process leading to the determination of allowable annual cuts, and the determination itself. Area-based harvest regulation has substantial implications for a number of components of timber supply information and analysis – inventory and growth and yield information, defining the timber harvesting landbase, defining projected ages and partial harvesting. Each of these components is reviewed separately in this section.

The Ministry of Forests Research Branch has completed a number of projects to examine timber supply issues related to area-based harvest regulation. To review these projects check the website: www.for.gov.bc.ca.research.areaaac.

a) Forest inventory and growth and yield considerations

A timber inventory indicates how much area of different types of forests exist within a management unit, while growth and yield information predicts the conditions of the trees in a forest over time. Currently inventory and growth and yield information is vital to several steps in a timber supply analysis. The consequences of shifting to area-based harvest regulation is outlined below for each step.

- **Aggregating to create analysis units**

  In a timber supply analysis, the multitude of forest types in most units are aggregated to create fewer analysis units,

which expedites analysis timelines. Studies indicate that aggregation choices have little effect on the maximum volume or area-based harvest rate. However, there has traditionally been a preoccu-pation to maintain extremely detailed volume information in timber supply analysis, with limited aggregation, which is time-consuming. Studies show that current inventory data and aggregation practices are adequate for this step in the timber supply analysis process for area-based regulation. In fact, some simplification and time savings are possible, and may be more readily accepted for area-based analysis.

- **Timber volume estimates**

  Volume-based timber supply analysis requires estimates of the amount of merchantable timber in each forest type. Separate estimates are needed for existing forests and managed forests, based on the expectation that silvicultural treatments will change the timber volumes in managed forests. These estimates are often the most influential on timber supply forecasts based on a volume-based harvest flow. They are also widely debated and not fully researched.

  With area-based harvest regulation, uncertainty about timber volume estimates do not affect timber supply forecasts. Consequently, the estimation of such quantities as site productivity and volumes for existing and regenerated stands become de-emphasized, though growth projections remain useful for defining green-up time and projected harvest ages (see below). The focus on generating, resolving, checking, processing, and conducting sensitivity analysis for volume data is substantially removed, thus reducing analysis costs. This is a major advantage of area-based harvest regulation. Although this information would not be needed for timber supply analyses, the forest industry would probably continue to use timber volume information for operational purposes.

- **Land base assumptions**

  Forest inventory information is used to define the forests that are merchantable and included in the timber harvesting land base. In most cases, with area-based analyses, height and age estimates would be adequate to identify low productivity sites that should not be included in the timber harvesting land base. Consequently, some traditional inventory information will be needed to identify marginal forests and analyze achievement of biodiversity objectives.

- **Green-up ages**

  This is the age at which a forest reaches a specified height to achieve a defined resource management objective. This height is estimated based on the site class of the area and height projections provided by growth and yield models. This information will still be required for area-based harvest regulation.

b) Defining the timber harvesting land base

Where allowable annual cuts are established under area-based harvest regulation, a change in timber harvesting land base (i.e. the land estimated to be economically and biologically available for timber harvesting) - for example a reduction to accommodate the establishment of a park or an increase due to the inclusion of a previously unharvested timber type - the AAC will change accordingly, at the time of the next determination. This makes the definition of the timber harvesting land base a critical task in timber supply analysis, though not any more so than under volume regulation.

Currently the timber harvesting land base is defined first by delineating the forested area that is considered operable—areas that are physically accessible and are feasible to harvest economically—and then deducting areas that are not suitable for timber harvesting such as sensitive areas or unmerchantable forests. Some are of the view that a more careful definition of the timber harvesting land base will be needed with area-based harvest regulation, though this may not be the case in practice. With volume-based AACs, as markets and technology have changed, licensees have harvsted timber from outside the previously defined operable area, provided resource management objectives are met. It is expected that this policy would continue with area-based harvest regulation, but it is not clear who would have the right to this additional AAC.

An additional topic that is expected to require consideration is how the concept of 'working forests' as currently being considered would interact with area-based harvest regulation.

c) Defining projected harvest age

In classic area-based harvest regulation, the allowable harvest level is defined by dividing the number of hectares in the timber harvesting land base by the projected harvest age—or rotation age—for the forest. In general, longer projected harvest ages would result in fewer hectares harvested annually. The amount of volume harvested and the size of the logs produced would depend on the growth characteristics of the forest. Studies have shown that defining the projected actual harvest age is a critical decision with area-based harvest regulation.

Originally, in BC the desired harvesting or rotation age was assumed to be the age when the long-term volume yield is maximized over several rotations (known by foresters as the maximum mean annual increment). This concept, however, is outmoded and has not been applied for a number of years. Currently, the information for a timber supply analysis includes minimum harvestable ages for each aggregation of forest types. This is the youngest age these forests are considered suitable for commercial harvesting, and is usually defined based on minimum timber volume or tree diameter criteria.

Projected harvest ages are not to be confused with ***minimum harvestable ages*** which define the *minimum* ages at which harvesting can commercially occur, and at which harvesting might need to take place for a period, in the future, to ensure a continuous supply of timber. Minimum harvestable ages do not necessarily represent the desired long-term harvest age. In fact, harvesting at minimum harvest age for long periods may result in low timber volume and value yields and small sized logs.

In current volume-based timber supply analyses supporting AAC determinations the projected harvest ages are an outcome of all other inputs, objectives and constraints. The projected ages represent a balance of objectives and factors including growth rates for stands; the existing state of the forest unit; the maintenance of desired age distributions of timber for wildlife habitat, visual quality, old growth, and biodiversity; the maximization of harvest volume; regeneration delays; adjacency and green-up restrictions; and opening size restrictions. Operationally the actual harvest age for forests in BC depends on the milling capacity and product lines of current milling operations, the availability of timber, and current policies regarding the minimum age that forests can be harvested.

Under an area-based harvest regulation policy, three approaches to defining harvest ages are envisioned:

- As is current practice, projected harvest ages could continue to be treated as an outcome of the analysis process. Indeed, the complexity of forest management issues defy the pre-determination of a desired set of rotation ages which represents a balance of objectives and forest types for a forest management unit.
- A policy decision could define projected harvest ages – rather than a technical decision. This policy would attempt to establish an appropriate frequency for cycling harvesting throughout the forest. The policy would attempt to strike a balance reflecting the multitude of forest uses and would make use of available scientific information on the growth, development and protection of forest ecosystems.
- A combination of the two approaches above is possible. Policy might define timber supply objectives, such as maximum long-term volume yield and even flow, and an approach for setting initial projected harvest ages for analysis. The outcome of analysis with this initial age would define whether adjustments would be made to better achieve the stated objectives.

Unfortunately the current debates over growth and yield projections in volume-based harvest regulation could be replaced by differences of opinion about projected harvest ages under area-based regulation, though this would substantially limit the sources of disagreements. The Forest Service sees this situation as an opportunity to more fully discuss harvest ages with stakeholders to refine timber supply analysis and harvest regulation policy.

d) Partial harvesting

Analyzing timber supply and determining allowable annual cuts for partial harvesting systems presents no additional difficulties under an area-based harvest regulation system than it does under a volume-based system – in fact there are advantages.

With volume-based harvest regulation, the following information is required for timber supply analysis:

- How much volume is harvested in each entry?
- When do you return to harvest (re-entry period)?
- How much does the forest grow between harvests?

With area-based harvest regulation, the first and third points requiring volume information do not affect the outcome, so this information is not needed. Only one question remains – what is the re-entry period?

In terms of the re-entry period, it is useful to compare timber supply modelling of clear-cut systems with partial harvesting systems. With a clear-cut harvesting system it is assumed that harvests may occur at some minimum time interval represented by a minimum harvestable age. In addition, there may be some (greater) harvest time interval that is more desirable given the multitude of objectives in a forest unit – the projected harvest period. With a partial harvesting system, it is also assumed that harvests may occur at some minimum time interval, known as a re-entry period. The challenges of defining re-entry periods for partial cutting systems with area-based regulation remain as they exist with volume-based harvest regulation. Site classification and growth and yield information will continue to be useful for this task, as will field experience.

Thus, the representation of partially harvested forest types under an area-based harvest regulation policy is not unlike that for volume-based regulation since:

- The analysis recognizes the forest types which are harvested under clearcut or partial cut systems;
- Projected harvest periods must be defined for each forest type;
- As is the case for forest types managed under clear-cut systems with different minimum harvestable ages, the AAC for the management unit need not necessarily be partitioned for partially harvested types; and
- Rules for governing which trees can or should be removed under a partial harvest system are governed by forest practices or incentives, and should be handled as a compliance issue.

The drawback of area-based harvest regulation with partial cutting systems is clarifying how to express the resulting AAC. Options that have been discussed include an equivalent clearcut area, basal area, or a partitioned cut—but these introduce more rather than less administrative complexity. For some this is a

compliance and enforcement issue, rather than an AAC determination issue, with the challenge being ensuring that licensees follow partial-harvesting prescriptions developed under an area-based AAC.

5. Timber supply analysis

Timber supply analysis with area-based regulation is much simpler than with volume-based regulation. The information needs are much less, primarily because extensive, detailed and contested volume projections are no longer necessary. Consequently there is no longer the need for the time-consuming tasks of determining acceptable volume harvest flows and monitoring the diagnostics (such as average harvest volume and growing stock over time) which are used to help evaluate the acceptability of alternative flows. At the simplest, the information needs include age class and commercial species distribution of the forest, projected harvest ages, and land base information such as park areas, operable landbase, management zones and practices in these zones.

An important component of timber flow policy is direction regarding the transition from the current actual harvest level to the projected harvest levels when there is a large difference. Current policies require that a maximum initial harvest level be sought which does not compromise the long-term sustainable timber supply, and provides for gradual declines in harvest level, if a decline is forecast. These long-standing policies saw their roots in the late 1970s and have been supported by the direction the government provides to the Chief Forester outlining social and economic objectives for AAC determinations, as required in Section 8 of the *Forest Act*. Assuming these policies continue, area-based determinations would need to define the maximum initial harvest area that does not compromise long-term timber supply and provides for a transition when needed. Ideally an even flow policy would be adopted, with an equal number of hectares harvested each year.

While the timber supply analysis for area-based AAC determinations has the potential to be simplified, it cannot be trivialized. Today's forest management necessitates an understanding of a complex mix of values and uncertainties. The process therefore cannot be relegated to that of a simple calculation. It will require an evaluation of a number of variables and analysis of the uncertainties associated with each through sensitivity analysis. One could resort to a simple formula to calculate the AAC, but it would be reckless not to project it into the future to understand its implications. Once this projection is made, a more comprehensive analysis that examines risks and uncertainties is needed.

6. AAC determinations

Overall the Timber Supply Review process for an area-based AAC determination would be similar to that for a volume-based determination. However in the transition from volume to area-based determinations, the workload would be somewhat more onerous because likely analysis for both volume and area basis would be required as methods are refined. Also, the socio-economic assessment would have to be revised to reflect the change in focus.

While the area-based AAC determination process has the potential to be simplified by eliminating some of the uncertainty and debate regarding timber volumes and growth and yield, it will continue to be complex, reflecting forest management today. The process will require assessment of a range of variables, an understanding of their uncertainties and the implications of these uncertainties. Ultimately, the determination of an area-based AAC, while potentially simpler than a volume-based AAC, will be a judgement based on a number of factors. Moreover, since none of the information used to make that determination (such as forest management assumptions, land base, inventory, social demands, etc) remains static, reassessment and re-determination will be necessary from time to time, as it is today.

Perhaps the most potent advantage of area-based harvest regulation is the expected increase in public credibility in the timber supply review process and AAC determinations. Area-based harvest limits are much easier to explain and to understand. They are more intuitively appealing. Harvest levels specified and controlled by area rather than volume units provide a more easily planned and measured verification of sustained yield objectives, which the public is seeking. It is recognized that partial harvesting creates some challenges to this simplicity.

An additional task for the Chief Forester will be to outline a transition strategy from volume to area-based harvest regulation, particularly if an impact on actual harvest levels is projected. It is likely that a comparison to the historical average area harvested will be required, with transition strategies suggested by local Forest Service staff, licensees and communities if a significant difference exists. As with volume-based regulation currently, the Chief Forester would then determine the AAC, seeking balance between achieving an even flow, maximizing harvest values over time and socio-economic implications.

It is possible that area-based allowable annual cuts will change public questioning in a positive way – from the AAC determinations to the forest management practices which are embedded in determinations, and about which public choices must be made. Also, area-based determinations will help to illuminate the reasons for the current volume-based fall-down in harvest levels in some management units, and focus debate on the real question of whether the objective is sustainability of harvests or sustainability of forest ecosystems.

7. Timber tenure administration

The administration of timber tenures is closely tied to traditional volume-based harvest regulation in the province. Significant challenges exist to shift the administration process, but they are not unsurmountable. Some additional costs will be incurred to establish the new system.

Two fundamental questions have been posed with regard to timber tenure administration:

1. Is it necessary to use the same measure for the AAC determination and for tenure administration – or, put another way, could we have area-based harvest determinations and volume-based tenures?
2. How much can an area-based harvest policy be an impetus to reduce government regulation of the timber industry?

On the first point, one example already exists – an area-based AAC is set for TFL #43, a license held by Scott Paper Ltd. To manage a unit of cottonwood forests, this AAC is then converted to a volume harvest per year for timber administration purposes. The AAC is set on an area basis because the unit is small and homogenous in terms of growing capacity and species. Volume conversion has been required for timber administration under the *Forest Act*.

It is often pointed out that timber processing mills cut and measure volume not area, thus volume must be the most important measure for timber tenures. However, government's responsibility is to manage Crown land in the public interest, not necessarily volume in the industry's interest, making area-based harvest regulation more consistent with the public interest. Volume estimates may still be needed by the industry, and it would be up to the industry to develop the level of volume information needed for their own use.

In terms of government regulation, timber tenure administration on an area basis is likely to reduce government costs, decrease government interference in industry decisions, and give the private sector more control over its business.

Three areas of timber tenure administration have received substantial consideration: apportioning a new AAC and allocating operating areas in TSAs, license holder rights and obligations and compliance and enforcement. The advantages and challenges of area-based harvest regulation from these perspectives are detailed below:

a) Apportioning a new AAC and allocating operating areas in TSAs

After the Chief Forester determines an AAC for a timber supply area (TSA), the Minister of Forests must 'apportion' or divide the new cut level amongst the types of currently volume-based licenses listed in the *Forest Act*, and the Small Business Forest Enterprise Program (SBFEP). It will be a substantial challenge to distribute an area-

based AAC to license and associated chart or operating areas in TSAs so that there are consistent and equitable implications for the licensees– the transition from volume to area will be difficult. This is not an issue for single operator management units including woodlot licenses and tree farm licenses.

The fundamental conundrum within timber supply areas will be the alignment of a volume-based tenure with an area-based AAC. There are two dimensions to this dilemma – how much area to apportion to each volume-based licensee, and where this 'operating area' should be located. The problem of ensuring licensees have access to timber of equal value exists today with the current problem of allocating operating or "chart" areas to licensees. Hence, area-based harvest regulation does not present any new difficulties—licensees will continue to seek the stands of greatest value whether their allowable harvest level is specified in area or volume units. However area-based harvest regulation could magnify the problem where there is a great disparity in timber value per area across a TSA.

Possible solutions to this problem have been suggested:

- Current operating chart areas for licensees within a TSA are relatively stable. Assuming that licensees are given area AACs within their existing chart areas, they will continue to have access to the timber profiles they have historically harvested;
- Small licenses and the SBFEP should be assigned operating areas to facilitate implementation of area-based harvest regulation. This applies to SBFEP harvest within tree farm licenses as well;
- Volume-based tenures could be converted to area-based tenures first, with area-based AACs to follow;
- Implementing a system similar to that in Ontario—and now being considered under the Defined Forest Area Management concept—where licensees form an association and share in the development of a timber allocation strategy.

If operating or chart areas for licensees have to be reassigned to achieve consistent and equitable implementation of an area-based AAC, there may be difficulties that are not easy to resolve. Recent experience in the Strathcona TSA indicates that while solutions may be found to timber profile and cost issues, communities and other stakeholders may not be willing to accept changes in operators, particularly in sensitive areas where effective, trusting working relationships have been developed, or where value-added operators depend on a particular type of wood from a licensee. In addition, timber supply analysis will be required for operating areas to ensure equitable distribution of area.

Achieving equitable redistribution is likely the greatest challenge to implementation of area-based harvest regulation in TSAs.

b) Licence holder rights and obligations

Most licenses include clauses based on a volume-based AAC. Several of these clauses enact legislation designed to be implemented with volume-based harvest regulation. Legislation and license documents would have to be revised, and the internal government database (FTAS) that tracks AAC performance would have to be reprogrammed to implement area-based harvest regulation. These would be one-time changes and costs. Specific changes would be required to the several sections of license documents as outlined below.

Many of the following policies and legislated requirements are currently under review. Within the next year significant amendments or elimination of some of these requirements is expected. In some cases, these changes are likely to reduce the administrative barriers to area-based AACs.

- **Contractor requirements**

  The *Forest Act* and associated *Timber Harvesting Contract and Subcontract Regulation* require a specified percentage of the volume harvested from a license area each year to be harvested by contracted logging firms. While converting to area-based harvest regulation presents challenges, it is expected that this requirement can be equitably met. For example, performance could be based on a percentage of a licensee's annual area, instead of AAC.

- **Cut control**

  Licenses require operators to harvest at least a portion of the AAC annually, with variations of 50% below or above the AAC annually, and a 10% variation from the AAC over a five year cut control period. These requirements are intended to provide a constant flow of timber for community, employment and government revenue stability. While there have been concerns about establishing and monitoring year end cut-off for administering this requirement under an area-based regime, problems are not expected.

  One advantage of area-based harvest regulation is removal of the need to track which logs are included in the AAC and must be scaled for cut control and billing purposes, and which are 'off quota'. Off quota timber includes volumes that were assumed in the AAC determination not to be utilized, such as dead trees or logs that are smaller than the minimum size required by a utilization standard. Under volume-based regulation, this off quota timber must be tracked separately so that the volumes tallied for cut-control purposes are consistent with the assumptions made in the AAC determination. With an area-based AAC all the area harvested would be measured for AAC cut control purposes. An similar opportunity for savings exists in terms of timber harvested

from rights of way as the surveys of this timber that is currently required for cut control purposes would not be necessary.

- **AAC reductions for mill closure**

  Many licences include an 'appurtenancy clause' which requires the licensee to operate a mill in order to maintain their rights to harvest Crown timber. This was intended to encourage stable harvesting rates, and promote primary processing within the province. These clauses define the volume-based AAC reductions that will occur if the associated mill closes, based on the volume of Crown timber that is manufactured at the mill. Switching to an area basis will not be difficult.

- **Ownership transfer conditions**

  To expand the amount of timber on the open market through the Small Business Enterprise Program, licenses include a 'takeback clause' requiring that 5% of the timber volume apportioned to the license be removed from the license if ownership is transferred. It is expected that converting the existing volume takeback to an area takeback would be possible to implement.

- **Annual rent**

  This licensee obligation is currently levied on a volume basis. Changing to an area basis is seen to be simple.

- **Compensation**

  The *Forest Act* includes provisions for compensation of lost timber harvesting rights in particular situations. Compensation is based on the value of the lost harvesting rights, which includes evaluation of the amount of timber and the value of that timber. Under area-based harvest regulation, a volume and value estimate would need to be assigned to any loss of rights to harvest area. This is likely to increase the complexity of these negotiations in some cases.

- **Cutting authorizations**

  The current requirement for logging plans and cutting permits would not change with area-based harvest regulation, although there are proposals to remove the requirement for logging plans in the revisions to the Forest Practices Code.

c) Compliance and enforcement

It is generally expected that compliance and enforcement with area-based harvest regulation will not be a significant challenge. The primary question will be "are the hectares really being harvested?" which must include the area clearcut as well as any area that is partially cut.

According to some, the area actually harvested could be easily measured with current Global Positioning System (GPS) technology.

Others are of the view that more frequent, and possibly more accurate assessment of harvested areas will be needed to document the hectares that are actually harvested, particularly to track small areas (less than 0.5 hectares). Documenting partially logged cutblocks at year end is a potential problem that is sometimes raised because of current cut-control policy which requires calendar-year-end reporting. Accurate measurement of the area logged could create an increase in costs either to the government or industry, and may create compliance issues if industry collects the information but is not forthcoming in providing it to the government.

For some harvest activities determining specific areas that are harvested can be extremely difficult – such as salvage operations for pest management and other situations. This harvesting could be accounted for by converting any volume harvested to area, provided the area and volume harvested is large enough to justify this kind of oversight. However, this introduces more rather than less administrative complexity. If the volume is truly minor, this should not be necessary.

While there are concerns about how harvest regulation of partial cutting prescriptions will be determined, it is agreed that measuring the harvested volume or area for cut-control purposes does not ensure that the partial harvest prescription has been carried out as it was designed. Adequate compliance and enforcement monitoring is necessary to ensure prescriptions are followed.

There are also concerns about whether achievement of timber utilization standards, and coarse woody debris objectives, will be monitored. Again it is agreed that cut-control regulation does not ensure field compliance with these requirements. The need for compliance and enforcement monitoring would continue with area-based harvest regulation. This task is expected to require estimation of residual volumes, although it may be possible to use visual estimates rather than detailed volume calculations.

Controversy exists as to whether the risk of poor performance by licensees is reduced or increased with area-based harvest regulation. Some contend that an operator can access more volume without exceeding area cut limits by trespassing into unapproved areas (e.g. riparian areas). Under volume regulation, any extra volume generated from taking extra trees would (in theory at least) show up in the scale and be included in cut control assessments. With area-based regulation, compliance and enforcement monitoring is the only disincentive to an operator tempted to harvest trees from outside approved cutblock boundaries.

However some disagree that the risk of poor performance is any greater with area-based harvest regulation. In their view, performance is more strongly linked to operational planning and any concerns can be dealt with through compliance and enforcement monitoring, where trespass should be found under either form of harvest regulation, along with clearly stated standards for harvest reporting. In their view, the government is firmly in control of making area-based harvest regulation work, if it chooses to.

8. Revenue estimation and billing

While it is realized that changes in harvest regulation policy could have implications for revenue estimation and billing, these implications have not been investigated at this point.

9. Stability of volume or value harvested over time

Historically, timber harvesting rights have been allocated in BC to promote community and economic development throughout the province. One of the key government objectives has been community stability, which has been implemented in part through elaborate timber harvest cut control requirements in license documents. There are concerns that area-based harvest regulation will make it difficult to achieve this objective. Indeed, in heterogeneous management units where forests contain differing volumes or values per unit area, a policy requiring a constant area harvest could yield different total volume or value harvests over time.

Three questions should be considered in this context:

1. *If left to licensees, will acceptable self-regulation take place?* Will the more responsible operator manage to achieve a stable value flow of timber in the interests of maintaining a viable work force; providing a stable cash flow to fund operations; being able to pay regular shareholder dividends; and gain public approval for conducting its forest management in an acceptable manner?
2. *Would the resulting variation in yearly volume or value of harvest be much different from that which has taken place over the last several decades under BC's volume-regulation policy?* While the British Columbia government has regulated timber volume harvests from Crown lands in the interest of community stability and sustained yield, changing markets and technology have thwarted such goals at times. Some argue that forest-based communities thrive or decline due a set of complex factors that no amount of regulation can overcome. Others believe harvest regulation has worked, and should not be abandoned

   In fact, policy changes are being developed which de-emphasize regulation of yearly variation of harvests volume in the interests of allowing the forest industry to be more reponsive to markets.
3. *Can and should variations in volume or value harvested be regulated?* If the previous questions are still valid and the answers to them are "no" then perhaps an area harvest regulation policy might not be appropriate for British Columbia, and the existing volume regulation policy should remain. On the other hand, if regulation of harvest volume and its annual variation is less critical, then area regulation might be preferred. What should be avoided at all costs is a policy which regulates both area and volume. Such excessive regulation is

counter to the intent of the proposed area regulation scheme and government direction.

Further consideration is needed as to whether or not policy tools are required to achieve objectives of community stability with any type of harvest regulation, including even flow area-based harvest regulation. Some expect that global market forces now expecting product certification will address the potential instability of harvest flow and negative community implications.

10. International trade and product certification

Much of BC's wood products are sold in the global marketplace, with an historical emphasis on the United States. Consequently, the perspective of the international marketplace must be considered when developing harvest regulation policy for BC.

Environmental certification is another market force that BC producers are currently facing. Even flow area-based allowable annual harvests should satisfy certification requirements for sustainability, but may not meet conservation expectations. Also, certification may be more onerous if less inventory information is collected due to the reduced need in harvest regulation if this information is needed for certification.

Generally there are advantages to area-based harvest regulation in the international trade and product certification forums, including increased ease of public understanding and better fit with sustainability.

E. Options for Implementing Area-based Harvest Regulation

Extensive and wide ranging discussion and consideration of the options for harvest regulation have occurred within government and with a number of stakeholders. The options considered have ranged from no harvest regulation at all, on the suggestion that the Forest Practices Code provides adequate land management regulation, to creating a 'toolkit' of harvest regulation tools that are used in appropriate circumstances. There is general agreement with the need to test a range of options.

The following provides details on the pros and cons of a scope of implementation approaches that have been most thoroughly considered including:

1. Reporting area information in timber supply analyses
2. Partitioned area-based allowable annual cuts
3. Woodlots and community forest agreements
4. Tree Farm Licenses
5. Timber Supply Areas

1. Reporting Area Information in Timber Supply Analyses

The first step in moving toward area-based harvest regulation may be to include more information regarding the area projected to be harvested in current volume-based timber supply analysis for the Timber Supply Review and land use planning, including the possibility of an even flow area-based harvest forecast. In this way, decisions would continue to be made on the basis of volume, but area statistics would be available.

The benefits of this approach include:

- Little change in current analytical practices and process would be required and the workload would not increase substantially;
- The area information could be considered in the AAC or planning decision, resulting in better informed decisions;
- The issue of the sustainability of allowable annual cuts would be approached from another direction, which would inform the current debate;
- AAC determinations will likely be better understood by individuals who are less familiar with these decisions, including the public, the media and some resource management personnel;
- This information will help to clarify the distinction between sustainability of volume yields, the quality of forest practices, and sustainability of ecosystems. For example, declines in harvest volume can occur while area harvested remains constant; and
- In some circumstances licensees may be encouraged to begin rationalizing operating areas and a licensee's commitment to a particular operating area may increase.

While this approach appears to provide several benefits without additional costs or change in process, several drawbacks have been identified:

- There is the potential to confuse people with two parallel systems and some may jump to the conclusion that area-based harvest regulation is being implemented without proper public policy discussion;
- If a broad range of public interests (particularly both environmentalists and industry) support the approach, there will be pressure to expedite implementation when more cautious implementation may be appropriate;
- If the actual area currently harvested is greater than the projected even-flow area-based harvest level, it can be expected that area-based harvest forecast information will be controversial;
- This additional information won't influence those who are intent on promoting reduced harvesting, particularly those who contend current practices do not ensure sustainability of ecosystems and seek reduced harvesting to achieve that objective;

- Emphasizing the implications of harvesting older timber first will further expose this controversial practice and feed the current debate; and
- Socio-economic assessments will need to reflect both volume and area information, which would require a refinement in techniques, but is manageable.

There is agreement within government that this first step should be taken, as time and resources permit, to advance timber supply analysis and decisions resulting from these analyses, particularly AAC determinations.

2. Partitioned Area-based Allowable Annual Cuts

In situations where merchantable timber volumes are difficult to define, but the area this timber occupies is definable, it may be appropriate to establish area-based harvest levels. The advantages of an area-based AAC determination rather than a volume-based determination include:

- Complex and often costly collection and analysis of timber inventory information for these sites is avoided;
- An additional approach to encourage rehabilitation of sites occupied by otherwise unmerchantable timber is created; and
- It is a convenient way to regulate the harvest of sites which lend themselves to 'lump-sum' sales.

Establishing an area-based partitioned cut within a volume-based AAC in the same unit may essentially create a new, separate sustained-yield unit for the area within the partitioned cut, which is considered a downside by some.

This approach has been tested in the Cranbrook TSA where the Chief Forester recently set area-based partitioned cuts for dense pine problem forest types and fire-maintained ecosystem ecosystem restoration. The text of the determination reads:

> Effective January 1, 2001, the new allowable annual cut for the Cranbrook Timber Supply Area will be 871,000 cubic metres per year. Of this total AAC, 838,000 cubic metres is to harvested from the timber harvesting land base as described and included in the current analysis, and the remaining AAC is to be administered as a partition of an annual harvest area as follows:
>
> - 380 hectares per year for problem forest types (see definition below); and
> - 230 hectares per year for fire-maintained ecosystem restoration (see definition below).
>
> **Partition Definitions**
>
> *Problem forest types partition:* leading-lodgepole pine stands that are older than 40 years, at least 19.5 metres tall, and for which at least 5000 stems per hectare are between 2.5 centimetres and

12.5 centimetres in diameter (measured at breast height).

Fire-maintained ecosystem restoration (FMER) partition: areas classified as FMER – open range, or FMER – open forest as per the 'synthesized ecosystem management units' described in the *Cranbrook Forest District Fire Maintained Ecosystem Adjustment Strategy, March 1998.* These are sites with low timber growing potential as per the criteria in Table A-11 on page 117 of the *Cranbrook Timber Supply Area Analysis Report, December 1999,* on non-productive or or non-commercial sites as per the forest inventory, or on existing open range sites as classified in the forest inventory.

Forest Service staff identified that approximately 30,000 cubic metres of problem forest types could be harvested per year, for approximately 30 years, to return these areas to forest production. Staff then advised the Chief Forester that 'due to lower merchantability on these stands, it is difficult to determine an accurate merchantable volume that meets current utilization and grade standards.' Consequently, the Chief Forester set an area-based AAC for this partition which avoided the need for certainty in the volume estimate.

A similar situation occurred with fire-maintained ecosystem restoration. In this case staff estimated merchantable volumes of 10 to 50 cubic metres from these forests. Based on this estimate, approximately 3,000 cubic metres could be harvested from 230 hectares annually to achieve the restoration goals in 30 years. Because of the uncertainty in the estimate of timber volume, the Chief Forester set an area-based AAC for this partition as well.

Although the Chief Forester was clear in his AAC rationale statement that he expected the partitioned AACs to be administered on an area basis, timber tenure administrators found this difficult based on their interpretation of the current legislation and policy framework. Although this timber was apportioned to and will be sold through the Small Business Forest Enterprise Program, where the greatest administrative flexibility exists, current administrative procedures prevented full implementation of this determination on a true area management basis. The following legal and policy reasons have been given for this situation:

- Section 10 has been interpreted to require the Minister to apportion an AAC based on volume, not area.
- The timber tenure administrators are of the view that the *Forest Act* does not allow for area-based non-replaceable forest licenses.
- There is the perception that because volume information is required for revenue estimates, it is most efficient to administer tenures on a volume basis.

In addition, timber tenure administrators have viewed it to be their responsibility to provide the volume information required by proponents to prepare their bids. Others are of the view that it is the responsibility of the proponent to secure this information.

The implementation of this determination has reinforced the need for legislative and policy changes to support the full implementation of area-based AACs.

3. Woodlot Licenses and Community Forest Agreements

Woodlots and community forest agreements include relatively small, homogenous areas where there is often a high level of public interest in forest practices and harvest levels. They are smaller operations, often with scarce resources, and there has been discussion of implementing area-based harvest regulation in these areas first. The advantages of area-based regulation for these units include:

- Woodlot owners and community stakeholders relate to geographic area so allowable annual cuts expressed in area would be more understandable to these individuals;
- Removing the costly analytical requirements of traditional volume-based timber supply analysis recognizes the limited financial means of these licensees;
- Forest development plan cutblock proposals would be much more accurate and would more closely approximate what would happen on the ground;
- Cut control will be simplified because the area harvested can be directly compared to an area-based AAC to confirm whether requirements have been met;
- There is less risk of undercutting the defined AAC with resulting cut control problems requiring additional, unanticipated harvesting, with expensive mobilization and demobilization costs;
- There is less risk of overcutting the defined AAC, removing the need for licensees to monitor every truckload when harvesting is close to the cut control maximum. As well there is no need to worry about scale returns or weight scale stratum problems;
- The need for plan amendments to deal with volume estimate discrepancies would be eliminated, resulting in cost savings for licensees and administrative savings for government; and
- There is less risk of incomplete, ragged block boundaries susceptible to blowdown that sometimes result from logging based on a volume basis.

Three drawbacks have been noted:

- Initially there will be uncertainty regarding the sustainability of the current long-term harvest. Although an additional cost would be created, total resource plans would become valuable to illustrate the distribution of harvesting over time, and to ensure short-term harvest focus on higher value timber, creating uneconomical residual forest values, does not occur;
- In unusual cases it may be necessary to amend forest development plans to implement an area-based AAC; and

- Enforcement must be sufficient to ensure the residual forest is not uneconomic for future harvests.

Implementing area-based harvest regulation for woodlots and community forest agreements would permit testing and learning through staged implementation on simpler management units first. Advantages of taking this step include:

- The size of the units limit the complexity and scope of inventory and analytical requirements;
- Information to inform the general debate about the sustainability of volume-based AAC determinations will be provided;

This approach is not without downsides however, including:

- Some licensees are focused on partial cutting, where area-based regulation is challenging to implement – volume-based harvest regulation may need to continue for these licenses; and
- These trials may create public pressure on large community forests and small tree farm licenses to shift to area-based harvest regulation before the techniques are properly developed for larger units.

There is general consensus that shifting to area-based harvest regulation on woodlot licenses and community forests is a low risk way of testing this new approach. In addition, the Federation of BC Woodlot Associations is supportive of the idea. However, this step must not be interpreted as an unqualified recommendation to switch to area-based harvest regulation immediately everywhere. This is a cautious vote of confidence, and an opportunity to test the approach in real world situations.

4. Tree Farm Licenses

Tree farm licenses in BC range from relatively small, homogeneous, contiguous units, to large, sprawling units that range across the length of the BC coast. In all cases these licenses confer the responsibility for management of a defined area to a single operator. The implications of shifting to area-based harvest regulation for these units is complicated, reflecting the increased size, biological and management diversity, and range of operators. The benefits include:

- Less inventory and growth and yield information is required and timber supply analysis would be easier;
- AAC determinations would be easier, partly because of expected improvements in public understanding that these determinations are different from land use planning choices;
- Cut control administration would be simplified because measuring area is easier than volume measurement, assuming volume measurements would not be needed, and off quota grades would cease to be an issue;

- Residue and waste surveys would be less rigorous, if at all necessary;
- If the projected harvest area is stable, sustainable management will be illustrated and certification would be supported; and
- The approach focuses attention on managing a delineated area of forest land, not a sometimes abstract volume.

The downsides are seen to be significant at this point in time. Many of these downsides may disappear after more learning is achieved through the trials on simpler licenses. The current downsides include:

- A potential for administrative complexity is created for operators with two systems of harvest regulation for different licenses;
- Disagreements about rotation or harvest ages are likely, possibly requiring extensive analysis and negotiations;
- Harvest volume could increase or decrease dramatically with area-based harvest, and volume flows over time could be more unstable, which may be a benefit to an operator, but may create concerns about employment and community stability. However, this may not differ from volume-based AACs which have changed in the past when policy changes are implemented;
- It may be easier for operators to focus on higher value timber and degrade the long-term timber value of the unit; and
- Some way of evaluating partial cutting will have to be defined, regardless of the technical difficulties.

Substantial concerns remain about overcoming the identified drawbacks to defining area-based allowable annual cuts for tree farm licenses. However, cautious experimentation is endorsed where licensees are willing partners, to test the reality of current concerns and develop feasible solutions.

5. Timber Supply Areas

The complexity of reconciling operating areas for volume-based forest licenses within TSAs, and the intuitive conflict of a volume-based license with an area-based AAC, makes initiating area-based harvest regulation in TSAs a task that few may have any appetite to tackle. If tenure reform leads to area-based licenses in these units, then a shift in harvest regulation may be appropriate.

There is some potential to consider area-based AAC determinations for TSAs that currently have long-term even flow volume forecasts – approximately 1/3 of the TSAs currently meet this criteria. In these cases both area and volume-based information could be provided to the Chief Forester, to inform the determination, which could be expressed in area terms. This approach extends the potential to address concerns about the sustainability of AAC

determinations beyond current area-based tenures in BC. However, for this approach to be efficiently implemented, an area-based forest license would be needed to avoid the requirement to translate the area-based AAC to volume terms for apportionment to the volume-based licenses in TSAs. This is the main deterrent to implementing this opportunity.

Until the volume/area conundrum is reconciled, it appears inappropriate to make recommendations on area harvest regulation in timber supply areas.

F. Next Steps

There is general agreement that area-based harvest regulation should be added to the toolkit of forest management policies in BC. It should be fully developed and implemented where it is more effective than the current volume-based approach. Area-based regulation is consistent with current trends towards rigorous certification, increasing support for sustainable management that is intuitively understood, and reduced government regulation and involvement in business. Implementation through trials is recommended, with broad communication of ongoing learning.

1. Legislative and policy changes

To implement area-based harvest regulation, amendments are required to current legislation and government policies that now require harvest levels to be managed on the basis of timber volume. Amendments to Section 151 of the *Forest Act* have been approved to allow trials of area-based AAC determinations to proceed for woodlots, community forest agreements, tree farm licenses and timber supply areas, including determinations for partitioned cuts. Current timber tenure administration policies should now be examined to ensure real and perceived barriers to area-based regulation are removed.

2. Expanded timber supply analyses

There is agreement that including analysis on an area basis in timber supply analyses during the timber supply review is one way to begin to understand the implications of shifting to an area-based regime. By examining the area of harvest resulting from the base case forecast it is possible to assess the timber supply outcomes of an area-based AAC. This is currently being done in the Timber Supply Review as time and resources permit.

3. Trials

It is agreed that area-based harvest regulation should be tested in trial situations to better understand its application, and to work through any potential limitations. A small set of trials are being implemented as follows:

a) Partitioned cuts

The recent amendment to the *Forest Act* addresses some of the barriers that were experienced in the implementation of the partitioned cuts in the Cranbrook TSA. Less restrictive interpretation of other sections of the *Forest Act*, and possibly updated policies will facilitate full implementation of area-based AAC determinations for partitioned cuts.

b) Woodlot License Trial Project

In November 2000, a provincial trial was initiated to test the feasibility of establishing and regulating area-based AACs for woodlots. This program—the Woodlot Licence Area-based Allowable Annual Cut Trial Project—is expected to involve a number of woodlots around the province. Substantial details on the structure of the program, criteria for selecting woodlots for the trial and timber supply analysis practices have been developed. With the completion of the legislative amendments, this initiative is now able to move forward.

Stay up to date through the Woodlot License Trial Project website at:
www.for.gov.bc.ca/research/woodlot

c) Community Forest Agreements

The high level of community and public interest in management of the forests within community forest agreements, and the simplicity of area-based harvest regulation is expected to lead to high interest in this approach. Community forest licensees often don't agree with what they perceive as the current emphasis on timber volume in the areas they manage, and would likely better understand and be better able to explain an area-based 'rate of timber harvesting' – the term used in these agreements. Forest Service staff encourage discussion with community forest licensees to introduce area-based harvest regulation and consider the benefits and drawbacks for particular licenses.

d) Tree Farm Licenses

Several tree farm licensees have volunteered to test area regulation cooperatively with the Forest Service on their tree farm licenses. These trials are presently in start-up phases while they were awaiting the legislation changes. Other tree farm licensees have indicated interest in this approach and will be included as trial areas as time and resources permit.

4. Technical and Policy Issues Requiring Further Attention

Several technical and policy issues have been identified that require further analysis and consideration including:

- defining the appropriate projected harvest age;
- improved accuracy of timber harvesting land base definition in some units;

- appropriate allowable annual cut determination and regulation for partial cutting;
- disincentives to area-based harvest regulation that result in devaluing the residual forest; and
- clarification of *Forest Act* sections, associated regulation and policies that are seen to deter implementation of area-based AACs.

The Ministry of Forests is committed to broadly communicate the results of trials and further technical work. Stay up to date through the Area-based Allowable Annual Cut Analysis Project at:
www.for.gov.bc.ca/research/areaaac.